point qui soit placé par rapport à a, b, c comme le point m est placé sur N″* par rapport à a'', b'', c''. Le point μ'_2 s'obtient de la même manière sur N′. Les points μ_2 et μ'_2 sont alors aussi les projections sur N et N′ d'un même point de la corde de contact μ_1 μ'_1.

La droite μ_2 μ'_2 est donc tangente à la parabole comme nous l'avions déjà trouvé.

Les segments ab, $a'b'$, sont les projections sur N et N′ d'un segment de μ_1 μ'_1, qui, lui même, est la projection sur le plan (N, N′) du segment de Λ, qui se projette sur N″ en a'' b''.

Ce segment de Λ rencontre le plan (N, N′) au point de μ_1 μ'_1 qui se projette sur N et N′ en μ_2 et μ'_2.

Ce que nous venons de trouver en considérant le plan (N, N′) peut se répéter pour les plans (N, N″), (N′, N″).

De tout cela résulte cette propriété qui établit une liaison très simple entre les six centres de courbure principaux de (E), (H′), (H″).

Trois surfaces homofocales du second ordre se coupent en un point m. *Les normales à ces surfaces en ce point sont* N, N′. N″. *Ces normales rencontrent les plans principaux des surfaces homofocales, la première en* a, b, c, *la deuxième en* a′, b′ c′, *et la troisième en* a″, b″, c″. *On élève respectivement de ces points des plans perpendiculaires à ces normales. Les plans issus des points* a, a′, a″ *se coupent en un certain point. On obtient de même un point pour* b, b′, b″ *et un troisième point pour* c, c′, c.″ *Ces trois points appartiennent à une même droite* Λ.

Les projections de Λ, *sur les plans déterminés par les normales* N, N′, N″, *prises deux à deux, rencontrent ces normales aux centres de courbure principaux des trois surfaces homofocales.*

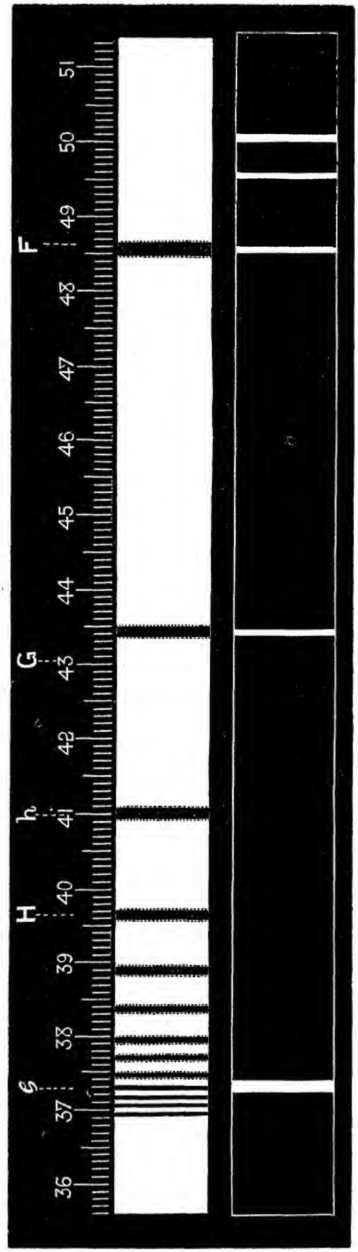
Ces centres de courbure sont alors aussi les projections sur les normales N, N′, N″, *des points où* Λ *perce les plans déterminés par ces normales prises deux à deux. La droite, qui joint les projections sur deux de ces normales du point où* Λ *perce le plan de ces droites, est l'axe de courbure de la ligne d'intersection des surfaces homofocales normales à ce plan.*

II. "Note on the Photographic Spectrum of the Great Nebula in Orion." By William Huggins, D.C.L., LL.D., F.R.S. Received March 9, 1882.

Last evening (March 7) I succeeded in obtaining a photograph of the spectrum of the great nebula in Orion, extending from a little below F to beyond M in the ultra-violet.

The same spectroscope and special arrangements, attached to the 18-inch Cassegrain telescope with metallic speculum belonging to the

* N″ n'est pas sur la figure, ni les points a'', b'', c''.


51
50
49
F
48
47
46
45
44
G
43
42
h
41
40
H
39
38
ς
37
36

Royal Society, were employed which have been described in my paper on "The Photographic Spectra of Stars."*

The exposure was limited by the coming up of clouds to forty-five minutes. The opening of the slit was made wider than during my work on the stars.

The photographic plate shows a spectrum of bright lines, and also a narrower continuous spectrum which I think must be due to stellar light. The bright stars forming the trapezium in the "fish's mouth" of the nebula were kept close to the side of the slit, so that the light from the adjacent brightest part of the nebula might enter the slit.

Outside this stronger continuous spectrum I suspect an exceedingly faint trace of a continuous spectrum. In the diagram which accompanies this paper the spectrum of bright lines only is shown, which is certainly due to the light of the nebula.

In my papers on the visible spectrum of the nebula in Orion, and other nebulæ,† I found four bright lines. The brightest line, wave-length 5005, is coincident with the less refrangible component of the double line which is strongest in the spectrum of nitrogen. The second line has a wave-length of 4957 on Ångström's scale. The other two lines are coincident with two lines of hydrogen, $H\beta$ or F, and $H\gamma$ near G.

In the photograph these lines which had been observed in the visible spectrum are faint, but can be satisfactorily recognised and measured. In addition to these known lines the photograph shows a relatively strong line in the ultra-violet, which has a wave-length 3730 or nearly so. The wide slit does not permit of quite the same accuracy of determination of position as was possible in the case of the spectra of stars. For the same reason I cannot be certain whether this new line is really single, or is double or multiple. In the diagram this line is represented broad to indicate its great relative intensity.

This line appears to correspond to ζ of the typical spectrum of white stars.‡ In these stars this line is less strong than the hydrogen line near G; but in the nebula it is much more intense than $H\gamma$. In the nebula the hydrogen lines F and $H\gamma$ are thin and defined, while in the white stars they are broad and winged at the edges. The typical spectrum has been added, for the sake of comparison, to the diagram.

I cannot say positively that the lines of hydrogen between $H\gamma$ and the line at 3730 are absent. If they exist in the spectrum of the nebula, they must be relatively very feeble. I suspect, indeed, some very faint lines at this part of the spectrum, and possibly beyond λ 3730, but I am not certain of their presence. I hope by longer ex-

* "Phil. Trans.," 1880, p. 672.

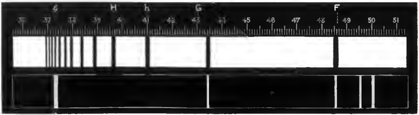
† *Ib.*, 1864, p. 437, and 1868, p. 540. Also "Proc. Roy. Soc.," vol. 14, p. 39, and vol. 20, p. 380.

‡ "Phil. Trans.," 1880, p. 677.

posures and with more sensitive plates, to obtain information on this and other points. It is, perhaps, not too much to hope that the further knowledge of the spectrum of the nebulæ afforded us by photography, may lead by the help of terrestrial experiments to more definite information as to the state of things existing in those bodies.

III. "On the Disappearance of some Spectral Lines and the Variations of Metallic Spectra due to Mixed Vapours." By G. D. Liveing, M.A., F.R.S., Professor of Chemistry, and J. Dewar, M.A., F.R.S., Jacksonian Professor, University of Cambridge. Received March 11, 1882.

The theory of spectral lines most commonly received is that the otions of the luminiferous ether producing them are not directly due to any motion of translation of the molecules of the emitting substance, but to relative motions of the parts of the same molecule, or in other words, to vibrations occurring within the molecules; and that the mutual action of the molecules, while it may give rise to irregular vibrations of the ether, affects the regular vibrations producing the lines only in an indirect manner, by converting part of the motions of translation into internal vibrations. On this theory the spectral lines which any given substance can readily take up will in general be limited to a certain number of fundamental lines and a number of others harmonically related to them, though not necessarily simple harmonics of the fundamental lines. And variations of temperature, by altering the rapidity and the violence of the action of one molecule on another, will alter the intensities of the several vibrations, but not their periods, unless the violence should extend to the disintegration of the molecules, which would be equivalent to the formation of new molecules with new fundamental periods of vibration. In view of this theory, the observations on the spectrum of magnesium have a special interest, because from the close analogy of magnesium to zinc and cadmium, it is inferred that the molecules of magnesium vapour are chemical atoms of that substance, that is to say, they pass apparently undivided through all the chemical changes to which magnesium may be subjected; and it seems reasonable to suppose that any subdivision of the chemical atoms could not fail in this case to be attended with a change of chemical qualities, which, in the presence of other elements, would give rise to new compounds. No such new compounds have in fact been detected. We have already described in detail the differences between the spectra of magnesium as seen in the flame of the burning metal, the electric arc, and the spark discharge, and we have now some further observations upon them to place before the Society, which are confirmatory of the received theory.



δ
H
h
G
F
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51